174. **Proposed by J. M. HOWIE, Professor of Mathematics, The Nebraska State Normal School, Peru, Neb.**

Describe a circle which shall pass through a given point and be tangent to two given circles.

*** Solutions of these problems should be sent to B. F. Finkel not later than Nov. 10.

CALCULUS.

135. **Proposed by COOPER D. SCHMITT, M. A., Professor of Mathematics, University of Tennessee, Knoxville, Tenn.**

To find the equation of the evolute of the common catenary

$$y=(\tfrac{1}{2}c)(e^{c/x}+e^{-c/x}).$$

136. **Proposed by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.**

Evaluate the definite integral

$$\int_0^1\int_0^1 \frac{v^{l-1}u^{m-1}(1-v^n)^{p-1}(1-u^s)^{r-1}dvdu}{[bv^n+c(1-v^n)]^{p+l/n}(u^s+a)^{r+m/s}}.$$

137. **Proposed by F. P. MATZ, Sc. D., Ph. D., Professor of Mathematics and Astronomy in Defiance College, Defiance, Ohio.**

Develop the equation of the curve assumed by the inextensible and revolving skipping rope.

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MECHANICS.

124. **Proposed by F. P. MATZ, Sc. D., Ph. D., Professor of Mathematics and Astronomy in Defiance College, Defiance, Ohio.**

A pendulum-bob, weight$=w$, is suspended by a perfectly elastic cord, length l. This pendulum makes n vibrations *up and down*, through a space of $2m$ inches while it makes a complete vibration in an arc of 2ψ. Determine the nature of the curve described by the center of the pendulum-bob in making one complete vibration in arc.

125. **Proposed by THOMAS U. TAYLOR, C. E., Professor of Civil Engineering, University of Texas, Austin, Texas.**

(1) If a parabola is described on the verticle face of a reservoir wall, axis vertical and in the surface, and $P\,(h,\,b)$ be any point on the curve, and B the foot of the perpendicular from P on the axis, find c. p. on area OBP.

(2) If A is point where horizontal through P cuts vertical axis (OY), find c. p. on area OAP.

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DIOPHANTINE ANALYSIS.

89. **Proposed by JOSIAH H. DRUMMOND, LL. D., Portland, Me.**

Show that in $2x^2+2y^2-z^2=\square\;....(1)$,

$$2x^2+2z^2-y^2=\square\;....(2),$$

$$2y^2+2z^2-x^2=\square\;....(3),$$

any two numbers and their sum and difference will satisfy the conditions.

90. Proposed by H. S. VANDIVER, Bala, Penn.

Prove that it is always possible to find an infinite number of positive integral values of x, y and z, such that the relation $z^2=x^2+bxy+cy^2$ is satisfied, b and c being any integers whatever.

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AVERAGE AND PROBABILITY

113. Proposed by F. P. MATZ. M. Sc., Ph. D., Professor of Mathematics and Astronomy, Defiance College, Defiance. O.

A given cube is cut by a plane in such a manner that the *lines of section* form a *regular* hexagon. What is the mean area of this hexagon?

114. Proposed by LON C. WALKER, A. M., Assistant Professor of Mathematics, Leland Stanford Jr.University, Palo Alto, Cal.

If a regular polygon of n sides be placed at random on another equal polygon, show that the chance that the center of the first will fall on the second polygon is $\dfrac{\pi}{2[\pi+n\tan(\pi/n)]}$

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MISCELLANEOUS.

114. Proposed by J. SCHEFFER. A. M., Hagerstown, Md.

When the sun's declination was 15° N. his altitude was found to be 20°, and after an hour's interval his altitude was found to be 31°. Required the latitude of the place of observation.

115. Proposed by F. P. MATZ, Sc. D., Ph. D., Professor of Mathematics and Astronomy in Defiance College, Defiance, O.

Determine geometrically where to stand so as to be able to throw a stone over a tree with the *minimum* velocity.

116. Proposed by J. A. CALDERHEAD, B.Sc., Professor of Mathematics in Curry University, Pittsburg, Pa.

Prove that

$$-\,|\alpha_1\beta_2\gamma_3|^2\begin{vmatrix} a & b & c\\ b & d & e\\ c & e & f\end{vmatrix}^2=\left\|\begin{array}{ccc}
\begin{vmatrix} a & b & c & \alpha_1\\ b & d & e & \alpha_2\\ c & e & f & \alpha_3\\ \alpha_1 & \alpha_2 & \alpha_3 & 0\end{vmatrix} &
\begin{vmatrix} a & b & c & \alpha_1\\ b & d & e & \alpha_2\\ c & e & f & \alpha_3\\ \beta_1 & \beta_2 & \beta_3 & 0\end{vmatrix} &
\begin{vmatrix} a & b & c & \alpha_1\\ b & d & e & \alpha_2\\ c & e & f & \alpha_3\\ \gamma_1 & \gamma_2 & \gamma_3 & 0\end{vmatrix}\\
\begin{vmatrix} a & b & c & \beta_1\\ b & d & e & \beta_2\\ c & e & f & \beta_3\\ \alpha_1 & \alpha_2 & \alpha_3 & 0\end{vmatrix} &
\begin{vmatrix} a & b & c & \beta_1\\ b & d & e & \beta_2\\ c & e & f & \beta_3\\ \beta_1 & \beta_2 & \beta_3 & 0\end{vmatrix} &
\begin{vmatrix} a & b & c & \beta_1\\ b & d & e & \beta_2\\ c & e & f & \beta_3\\ \gamma_1 & \gamma_2 & \gamma_3 & 0\end{vmatrix}\\
\begin{vmatrix} a & b & c & \gamma_1\\ b & d & e & \gamma_2\\ c & e & f & \gamma_3\\ \alpha_1 & \alpha_2 & \alpha_3 & 0\end{vmatrix} &
\begin{vmatrix} a & b & c & \gamma_1\\ b & d & e & \gamma_2\\ c & e & f & \gamma_3\\ \beta_1 & \beta_2 & \beta_3 & 0\end{vmatrix} &
\begin{vmatrix} a & b & c & \gamma_1\\ b & d & e & \gamma_2\\ c & e & f & \gamma_3\\ \gamma_1 & \gamma_2 & \gamma_3 & 0\end{vmatrix}
\end{array}\right\|$$

[From *Muir's Determinants*].

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